Quarterly Status Report

on

Electronic Energy Band Structure of Solids

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The investigations of the piezoresistance and the piezo-Hall effect of semiconducting $SrTiO_3$ have been continued. Preliminary measurements on a (110)-sample with 3.2×10^{18} carriers per cm^3 show the following results:

1. The piezoresistance at 300°K is very small and negative ($\simeq -4 \times 10^{-7}$/atm.). The piezo-Hall effect is of the order of $+3 \times 10^{-5}$/atm.

2. At 78°K and at 4.2°K the piezoresistance is much larger and positive; $\Delta\rho/\rho$ saturates for stresses of several hundred atmospheres at a level of 0.03 - 0.04. The change of Hall coefficient R_H with stress saturates also, but is negative (R_H decreases with compressive stress).

The saturation at low temperature is probably associated with the shift of the (100)-valleys under stress. The negative piezoresistance at room temperature could be a result of mobility anisotropy caused by the uniaxial stress.

Other measurements are concerned with the conductivity and Hall effect of (ceramic) $BaTiO_3$. Contact resistances make it difficult to obtain precise Hall data. However, good ohmic contacts have been produced on low resistivity $BaTiO_3$.

Dr. A. H. Kahn has been able to determine the binding energy and effective masses of polarons as a function of the mass anisotropy. He has applied his results to the case of $SrTiO_3$.

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